

GANZ



FOUR-UNIT EXPRESS RAILCAR TRAINS FOR SHORT-DISTANCE SERVICE



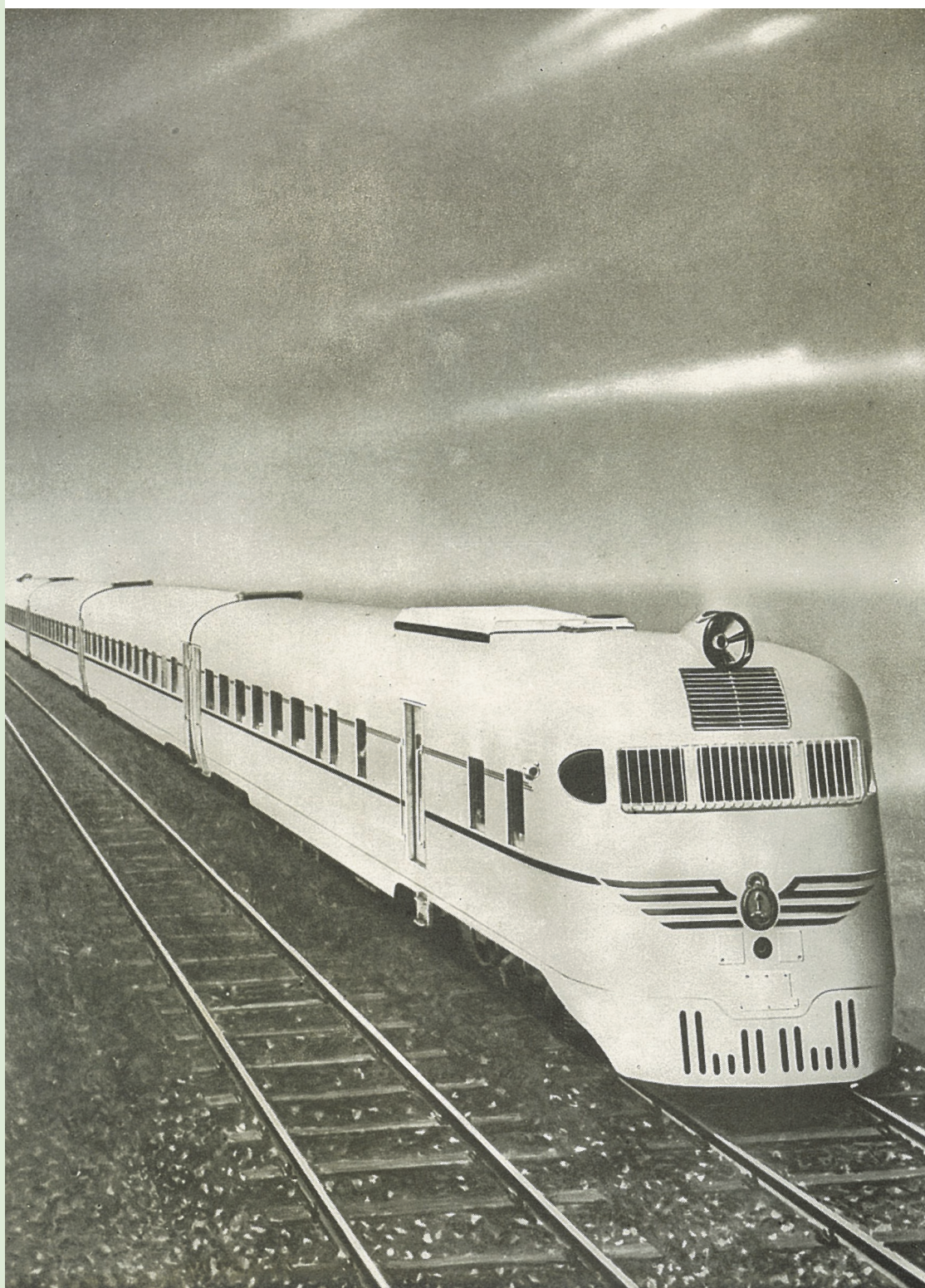


B U D A P E S T - H U N G A R Y

GANZ

FOUR-UNIT EXPRESS RAILCAR TRAINS FOR SHORT-DISTANCE SERVICE

16 trains supplied to the Argentine State Railways in 1950 - 1952



Four-unit railcar train of the Argentine State Railways. Engine power 2×600 HP

SPECIFICATION

Track gauge.	1,676 mm
Total train length with buffers	106.806 metres
Width of coaches	3.26 metres

Weight of car roof above rails	4.14	metres
Number of seats: two power-cars ..	116	
saloon car	108	
kitchen car	88 total	312 seats
Maximum speed	128	kmph
Weight of train in running order, approx. . .	224	tons



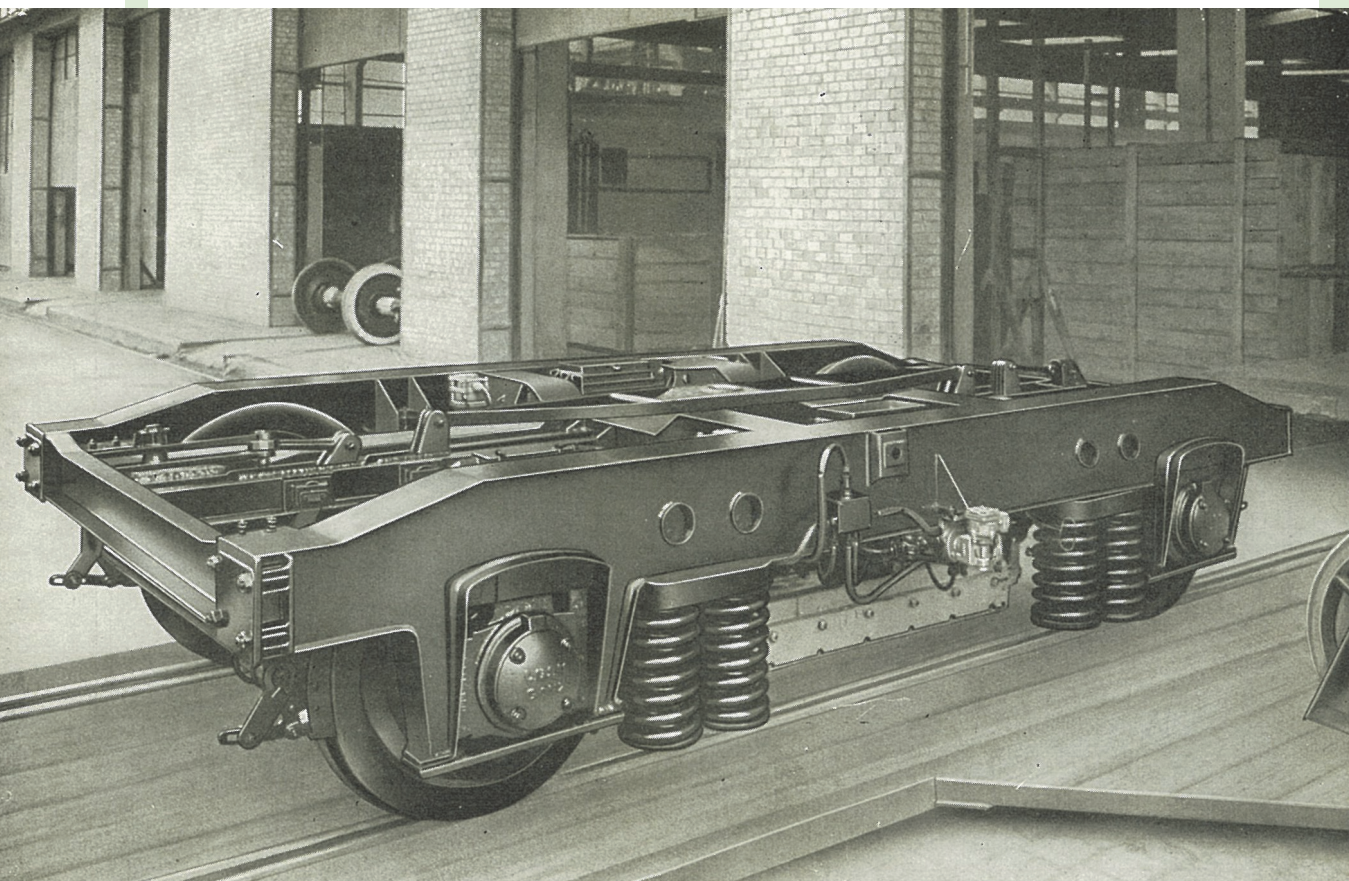
Four-unit railcar train of the Argentine State Railways. Putting on board at Rotterdam port.

The train consists of two ten-wheeled power-cars with two eight-wheeled trailers inserted between. In one of the trailers there is a kitchen and a refreshment bar. The two driver's stands are located at the front end of the power cars.

SOME DETAILS OF INTEREST

B O G I E S . Each power-car is provided with a six-wheeled driven bogie and a four-wheeled trailer one to distribute axle-load evenly. The trailers run on four-wheeled bogies.

The six-wheeled bogie carries the driving engine with the power transmission gear. Of the three axles, the two rear ones are driven. The wheels of the middle axle are flangeless. Instead of a centre plate, the required centric rotation of the bogie is secured by means of grooved, centering side bearers (Ganz - Rónai patent)



Four-unit railcar train of the Argentine State Railways. Trailing bogie

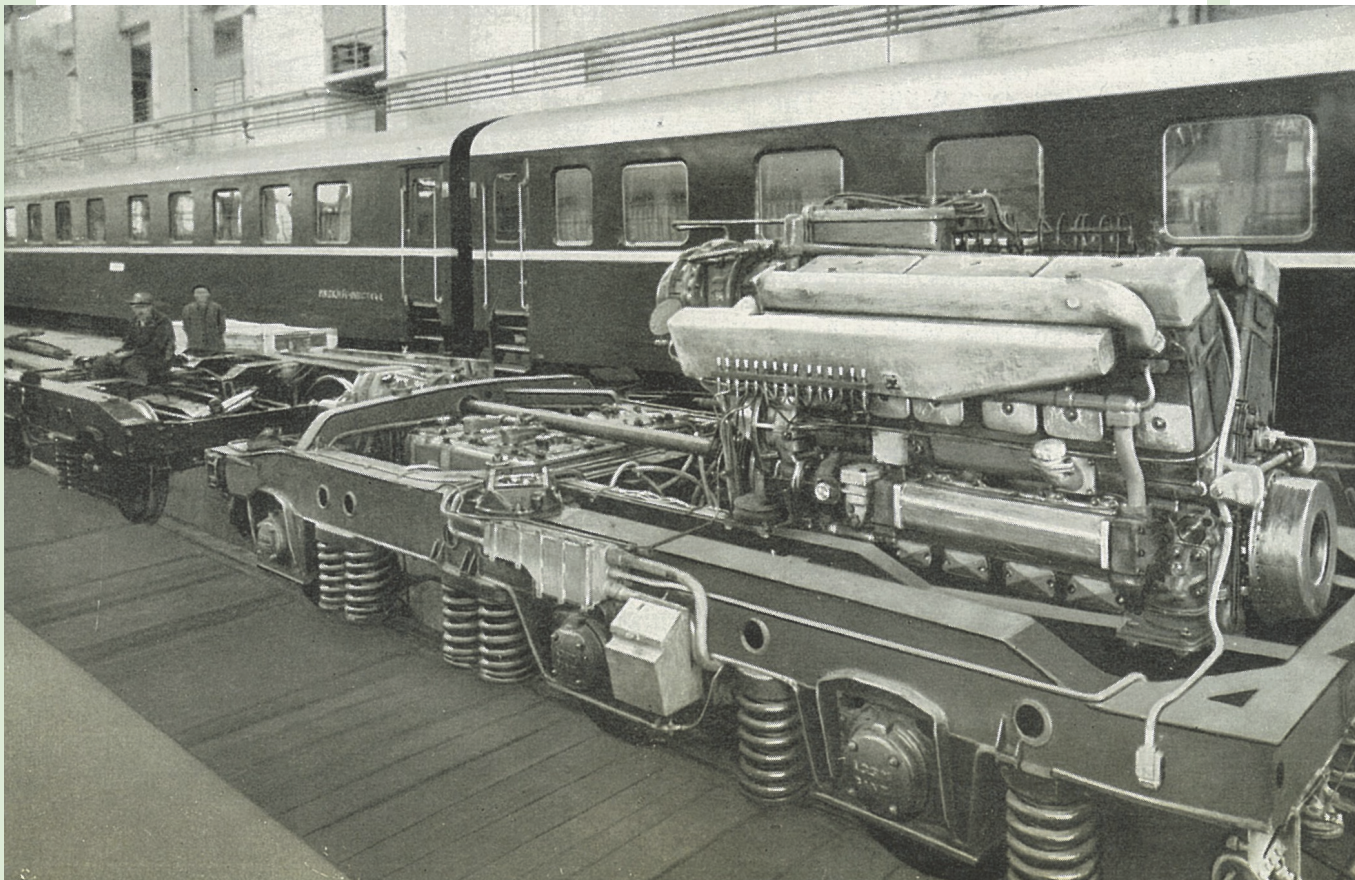
through which the car body is supported on the bogie frame without any material pivot.

The trailing bogies are fitted with conventional kingpins.

The axles are supported in self-aligning spherical roller bearings. The axle boxes are closely fitted to their pedestals.

BRAKES. The trains have a Knorr - Lambertsen type airbrake equipment engaging two brake shoes on every wheel, except on the power car trailing wheels. To increase the braking power, an electro-magnetic rail brake is also employed for quick braking on the trailing bogie of the power-car. In addition, each car is also provided with a hand brake.

BODIES. These are made of high-tensile steel sections and plates in accordance with the light-weight building system already



Four-unit railcar train of the Argentine State Railways. Power bogie

referred to. In constructing them, electric welding is employed. To reduce air resistance, a streamlined form is used with rounded contours. Coach ends are specially shaped by lengthening the side walls so as to reduce air eddies between them. This design gives additional strength to the front walls at the same time. A skirt, formed by lengthening the sheathing, lessens air eddies underneath cars. For heat and noise insulation, the inner side of the outer car sheathing is covered with a layer of sprayed asbestos.

DRAW AND BUFFER GEAR. Both power and trailer cars are provided with Ganz-type automatic central draw and buffer gears at each end. For connecting brake pipes and electric cables, separate couplers are employed.

FLOORING. The floor consists of a foundation of corrugated steel plate covered with a layer of bitumenated cork and a layer of 24 mm heavy plywood. The latter is coated with bitumen on both sides. In the compartments, an additional layer of 20 mm cork covered with a 4 mm linoleum coating is spread. In the luggage compartment the heavy plywood is protected by hardwood slatting, in the engine room by pressed steel plates, and in the kitchen by a floor of "asbetite". For lavatory and toilet floors, a magnesite bed with a glued-on 8 mm rubber sheet is used. These floors are excellent heat and sound insulators.

ENTRANCE DOORS. The cars are provided with comfortable steps of access arranged inside the entrance doors. The cavity in the floor formed by the steps is automatically covered up by a movable floor extension on shutting the entrance door which controls its movement.

INTERIOR PANELLING. Walls and ceilings have plywood panellings, the visible layer of which is of polished maple wood in the compartments, refreshment bar and vestibules, while in the kitchen, lavatories and toilets it is covered with stainless steel, sheet and in the engine room with aluminium. The panelling in the luggage compartment is of painted pine boards, protected by hardwood slatting. Ceilings are painted white, with the exception of the engine room which is covered with aluminium sheeting. Partitions are of 25 mm heavy plywood having panels similar to those of the compartments. The partition between engine and luggage space has a steel skeleton covered with steel plate on the engine side and with aluminium in the luggage room. Space between them is filled with sprayed asbestos. The compartment windows are fitted with wooden louvres.

FURNITURE AND OTHER EQUIPMENT

The interior furnishing of the coaches of these trains is carried out with a view to supplying the passengers with all the comforts which can be offered them under the given conditions. The coaches are furnished with comfortably sprung, leather-upholstered seats. The

backs can be tilted to face forward or to form boxes in which folding tables can be placed.

Along the side walls above the windows there are parcel racks, supported by light-metal brackets. Fittings are generally made of light metal, very suitable for the purpose.

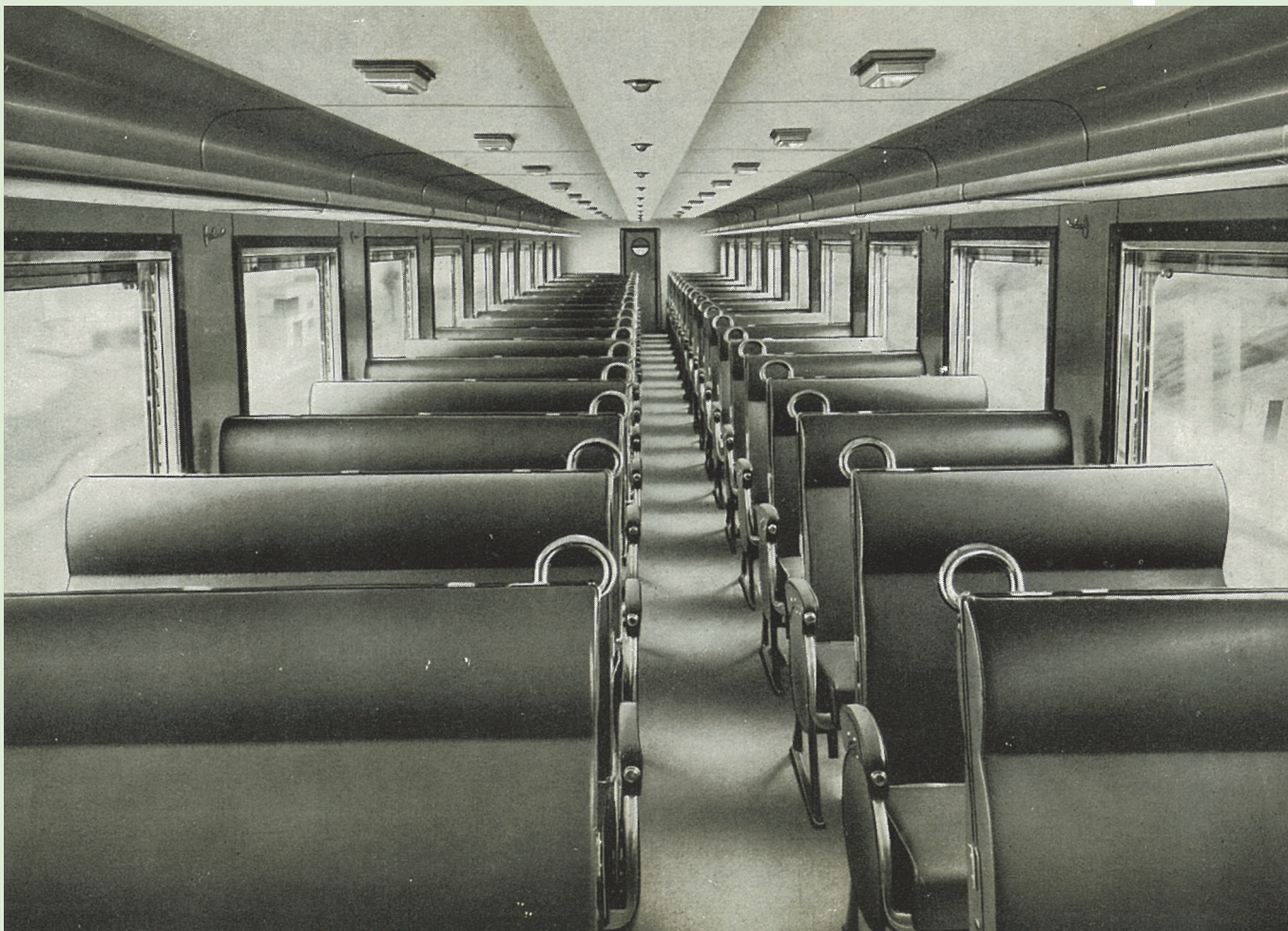
The kitchen is equipped with a gas cooker, a refrigerator, a table, a sink, cupboards and shelves, as required. Adjoining the kitchen, the refreshment bar is arranged, fitted with a curved counter with bar stools before it, with a glass-cupboard and is also provided



Four-unit railcar train of the Argentine State Railways. Interior

with an ice-cooled drinking-water tank. On the power cars behind the engine room there are luggage and mail compartments fitted with the usual equipment. Besides the lavatories, equipped with wash-basins, there are toilets fitted with marble-topped wash-bowls, mirrors etc.

The Diesel engine, projecting from the bogie into the engine room, is covered with a heat and sound insulating protecting hood. For the sake of easy access to the engine for inspection, this hood is amply provided with detachable lids. The outer surfaces of the hood are sheathed with aluminium. The driver's swivel chair faces



Four-unit railcar train of the Argentine State Railways. View of common passenger saloon

the front window with the two train attendants' tip-up seats on either side of the former. In front of the driver's seat, the master controller, the requisite instruments, the driver's air-brake valve, and the crank of the hand-brake are arranged. Before the train attendant's seat there is a toolbox which can also be used as a desk.

The front windows are made of safety glass and protected by grids. An adjustable eye-shade is provided against sun glare. Between coaches standard enclosed gangway passages are provided to enable passengers to move freely along the train.

VENTILATION AND HEATING

The installation provides for the replacement of stale air by fresh air, free of dust, as well as for heating in cold weather. There are two identical equipments in the two power cars, providing each separately for its own vehicle and both jointly for the trailers inserted between them.

The installation consists of three main parts:

1. heating equipment
2. air circulating installation
3. regulating equipment.

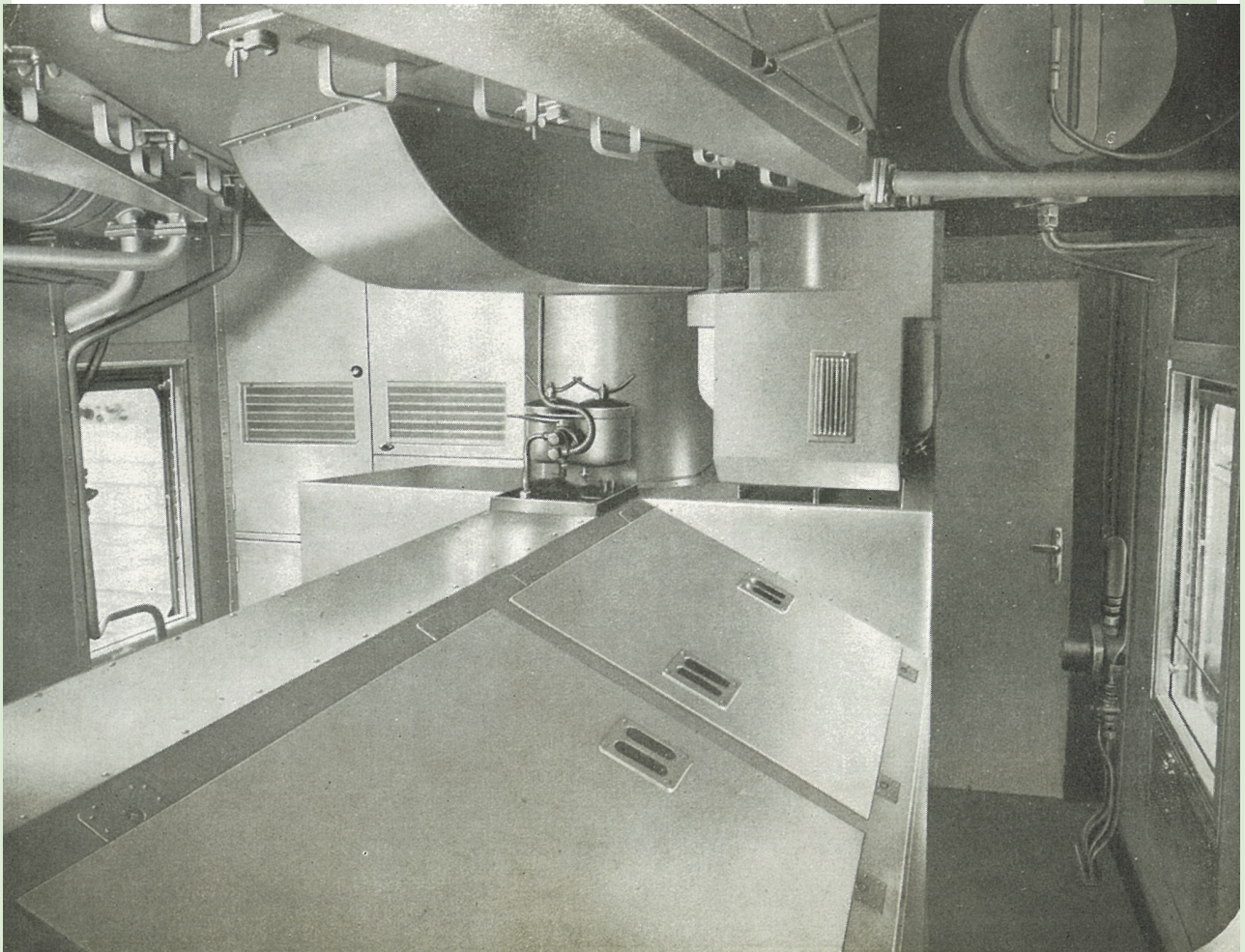
1. Air warmed by the engine cooling water provides heating. The heat of the water is transmitted to the circulating air by means of a radiator built into the ceiling air duct. Water circulation is maintained by an electric centrifugal pump.

2. Air circulates through the train by a system of ducts. Three air ducts built into the car ceilings run along the full length of the train. Through an aperture on the front of the leading power car, fresh air enters the first of these ducts. Automatically controlled flap valves keep the aperture of the front power car open and that



Four-unit railcar train of the Argentine State Railways. Refreshment bar

of the rear one shut. The second is the main pressure duct, also housing the heating radiator. Through this duct suitable freshened and – in cold weather – heated air is circulated as far as the middle of the train. Booster fans located at car ends force it into secondary pressure ducts whence – through suitable ceiling apertures – it reaches the compartments. The third is the return duct. The stale air is sucked back via openings arranged below the windows and by vertical shafts inside double partition walls to this duct. Air circulation is maintained by an electric fan inside the main pressure duct and by the above mentioned booster fans. A flap valve in front of the radiator regulates the proportion of fresh and return air. Kitchen, toilets, lavatories, luggage rooms etc. have inlet apertures only and none for the return of stale air.



Four-unit railcar-train of the Argentine State Railways. Engine compartment in power car

3. If the outside temperature drops below 18° C, the heating installation is put into operation by starting the circulating pump. Heating is controlled partly by varying the amount of water passing through the radiator, partly by changing the proportion of aspirated fresh air and return air. If no heating is required, only the ventilating installation is kept in operation to supply fresh air to the compartments.

LIGHTING. Current is supplied by two 72 V d. c. dynamos, working in combination with two storage batteries. Each power car is provided with a powerful searchlight and with a signal flare throwing a strong beam vertically upwards.

SIGNAL HORNS. In addition, each power car has a powerful air horn, and a less sonorous electric siren.

MECHANICAL EQUIPMENT

In the six-wheeled bogie of each power car a Diesel-mechanical power equipment, consisting of engine and transmission gear, driving two axles of the bogie, is installed.

I. ENGINE. Power is supplied by a XII Jvf 170/240 supercharged Ganz-Jendrassik Vee type Diesel engine. Its 12 cylinders have a 170 mm bore and a 240 mm stroke. Normal rating of the engine is 600 h. p. at 1150 r. p. m. The supercharger is a Brown-Boveri make and is, in essence, a gas turbine driven at high speed by the engine exhaust gases and coupled to a turbo-compressor which pre-compresses the combustion air. Crankcase and pistons are made of light metal.

The three governed speeds of the engine – 450, 770 and 1150 r. p. m. respectively – are set by a centrifugal governor fitted with

three springs. The engine has forced automatic lubrication and is provided with a safety device shutting the engine off in case of oil supply failure.

Push-button operated electric starter motors, fed by a storage battery, are employed for the starting of the engine.

2. POWER TRANSMISSION. From the rated output of the engine amounting to 600 h. p., 470 h. p. can be utilized for traction in the first and second gear, and 570 h. p. in the higher gears, by the transmission equipment of the car.

The engine power is taken via a cardan shaft with Hardy rubber disc joints to the dry friction type main clutch, mounted at the far end of the bogie. To overcome differences in level, a lowering gear is built into the clutch casing. This clutch is operated by an air cylinder attached to the casing but can also be engaged by hand in an emergency.

A mechanical-joint cardan shaft transmits the drive from the main clutch to a 5-speed gearbox, also housing the reversing gear. The wheels in the gearbox are in permanent mesh; when changing speed, they are locked to their shafts by means of multiple-disc friction clutches. The clutches are operated by air cylinders fitted to the bottom of the gearbox. Interlocking of the gear shifting levers is so arranged as to prevent two of the gear steps from being engaged simultaneously..

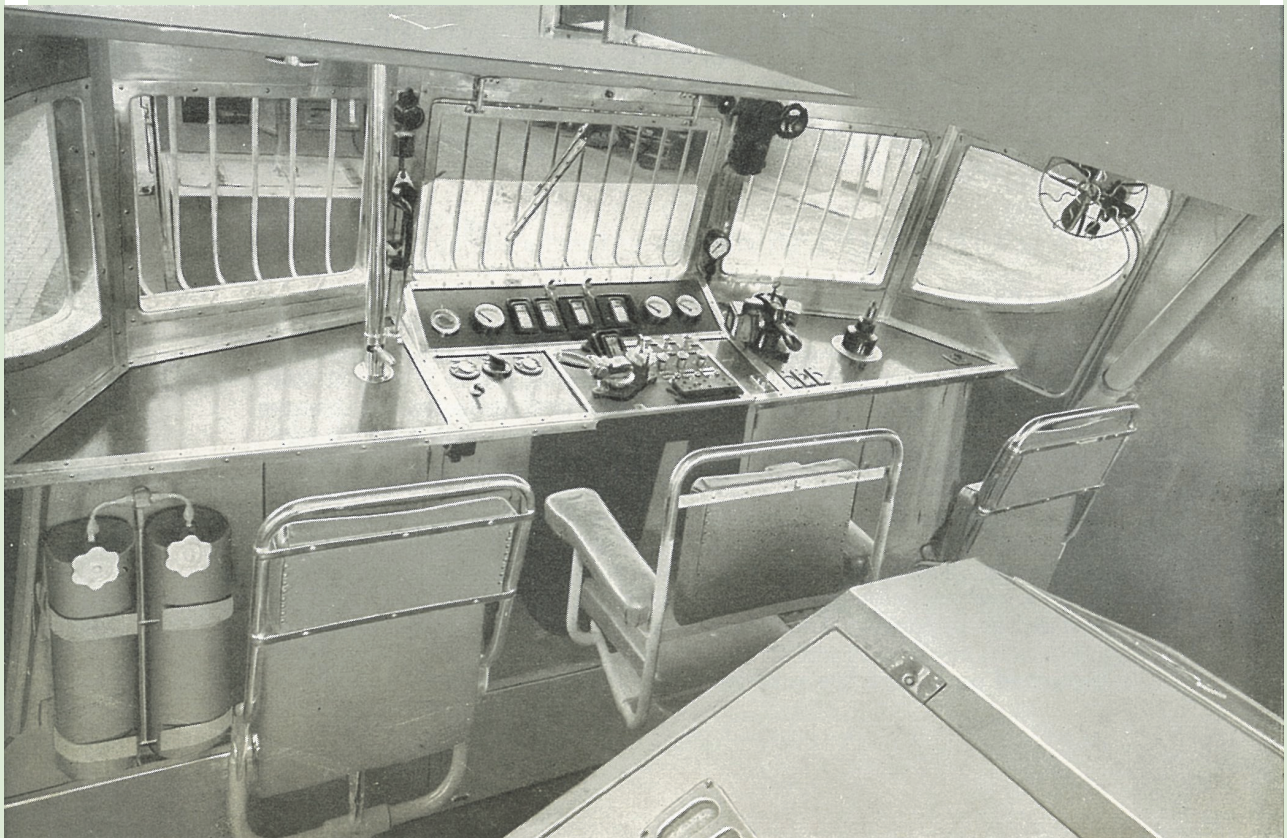
The five train speeds at an engine speed of 1150 r. p. m. with a wheel tread circle diameter of 920 mm. are:

1st = 23.3; 2nd = 38.2; 3rd = 57.0; 4th = 86.0; and 5th = 127.0 km. p. h.

The spur-gear, setting in both extreme positions the direction of travel, is mounted on the splined reversing shaft. Shifting (reversing) is effected by the air-cylinder piston; in case of emergency it can also be done manually by setting the reversing fork with a lever. The spur gear has an intermediate position where it is out of mesh with either connecting gear, gearbox and driven axles becoming disconnected. Power is conveyed by two mechanical-joint cardan shafts from both ends of the splined reversing shaft to the two axle-mounted bevel-gear final drives, and hence to the driven axles. The bevel gears are held in position by suitable reaction members suspended by springs from the bogie frame.

3.AUXILIARIES. Driving power for the auxiliaries is derived from the main engine. The drive is conveyed by a double-jointed cardan shaft from one of the main clutch shafts to the distributing gear, placed on a subframe slung from the underframe. Hence, further cardan shafts carry the drive to two dynamos and the air compressor on the subframe. One of the dynamos feeds the motor of the air circulating fans, the other supplies current for lighting and other purposes. The coolers of the engine cooling water are mounted on a separate subframe. Air is drawn by fans through the

cooler blocks. These fans also take their drive, via cardan shafts, from the distributing gear. A centrifugal pump, driven by the engine and mounted on the engine's crankcase, keeps the cooling water circulating, the water reaching the pump by force of gravity from a balancing tank. The volume of the cooling air is controlled by louvres actuated by compressed air and operated by cocks on the driver's desk. In case the train is forced to stop for longer periods in cold weather, the engines need not be kept running, thanks to a heating equipment installed. It consists of an electric heater immersed into the balancing tank, and an electric centrifugal pump to maintain water circulation through the engine. This equipment can also be fed with current from outside.



Argentine State Railways' four-unit railcar train. Driver's stand

4. C O N T R O L . Train can be controlled from either driver's stand with an electro-pneumatic remote-control equipment. Fuel feed, gear selection, reversing are effected by the master controller in the driver's cab. Since two power sets are to be controlled simultaneously, both driver's stands are fitted with all necessary instruments and appliances. In an emergency, direction reversing, main clutch, and first speed step can be set by hand through a trap door in the floor.

As already mentioned, reversing and speed selection are normally effected by pneumatic cylinders. Admission of compressed air from reservoir to air cylinders is controlled by electro-pneumatic valves

actuated by the master controller. A cupboard placed in the engine room houses these valves.

Compressed air for control is conveyed by flexible pipes from underframe to bogie. The entire control equipment is fed with the current of the above mentioned storage battery. An electro-pneumatic feed regulating device is mounted on the engine. It is governed by a handle to the left of the master controller. In case of inadequate air supply, fuel feed can be controlled by a hand-operated lever on the engine. Speed gear step selection is effected by means of a handle arranged at the right-hand side of the master

controller. Both power cars are equipped with a safety device which prevents the pneumatic elements of the transmission equipment from being engaged until control air pressure has attained the required minimum value for safe operation. Both power-cars are provided with a dead-man's handle which immediately shuts off engine feed and applies air brakes, should the driver let go of controller handle or take his foot off control pedal through sudden indisposition. Both cabs are provided with an electric speedometer. The engine revolution indicator, the voltmeter, the pressure gauges of control and braking air are arranged on a separate instrument panel. The window opposite the driver's desk is fitted with a pneumatic screen wiper and a pane warmer. Two or more trains coupled together can be controlled from the first driver's stand on the leading train. However, starting, cutting out or checking of the engine as well as reversing can only be effected from the respective trains' cabs. The cabs of the coupled trains have telephone connection. The railcar train described is one of a range covering a number of trains of several types. However, the differences are not important enough to deserve special attention. In order of supply, the train described is furnished first.



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FOUR-UNIT EXPRESS RAILCAR TRAIN OF THE ARGENTINE STATE RAILWAYS

Seating Accomodation 312 / Engine power 2x600 h. p. / Maximum speed 128 km/hr. / General Layout

